sat-nms DEICE

Deicing Controller

User Manual

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1 Introduction

The DEICE-Controller manufactured by SatService GmbH is a frontend-processor which is especially designed for satellite ground stations. It allows to supervise potential-free (alarm-) contacts, to switch external items, to measure different temperatures, to switch and control waveguide- or coaxial-switches, it is possible to assign the inhibit-contacts of the waveguide-switches to up to 10 connected HPAs and additionally it is possible to realize different 1 to n redundancy Systems.

The DEICE-Controller supervises altogether 48 digital-inputs via optocoupler. Up to 4 different temperatures can be measured with external PT1000 sensors. To switch external units, the DEICE-Controller has 6 potential-free relay outputs, 10 photomos-relay outputs and 16 switchable 24V outputs.

The data output is provided by 2 different and parallel available interface types: a HTTP Web Interface via an internal Web Server, and a RS232 interface. The ***sat-nms*** DEICE-Controller is controlled remotely by a monitoring and control application through the TCP/IP interface. The DEICE-Controller implements the protocols HTTP (for both, the user interface and for remote control) and SNMP. The ***sat-nms*** DEICE-Controller MIB may be downloaded from the DEICE-Controller itself using FTP.

This document is the user manual provided with the ***sat-nms*** DEICE-Controller It contains all necessary information how to install, setup and operate the processor. The user manual is available as a printed document and for online reading on the DEICE-Controller itself as well.

The paragraphs below give a short overview to the contents of this manual.

- Installation: The installation chapter guides through the installation and setup of the ***sat-nms*** DEICE-Controller. It describes the mechanical concept of the DEICE- Controller box and the assignment of the connectors. Finally you learn in this chapter how to set the DEICE-Controller's IP address, which is an essential precondition to operate the DEICE-Controller by means of a web browser. This section is available in the printed version only.

- Operation: The ***sat-nms*** DEICE-Controller is operated using a standard web browser like the Internet-Explorer on MS Windows based computers. The user interface design is straight forward and clearly structured. Operating the DEICE-Controller is mostly self-explanatory. Nevertheless, the 'Operation' chapter outlines the map of web pages which make up the DEICE-Controller user interface and elaborately describes the meaning of each alterable parameter.

- Remote Control: The ***sat-nms*** DEICE-Controller provides a versatile remote control interface. A monitoring & control software may fully operate the DEICE-Controller either through a TCP/IP network connection or through the RS232 interface of the DEICE-Controller. This chapter describes the communication protocol used for remote control and lists all parameters accessible through the remote interface.

- Connector Reference: This chapter provides a comprehensive reference of the ***sat-nms*** DEICE-Controller' input / output connectors.

- Specifications: At the end of the document, the specifications applicable to the ***sat-nms*** DEICE-Controller are summarized in this chapter.

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Support and Assistance

If you need any assistance regarding our ***sat-nms*** DEICE-Controller, don't hesitate to contact us. We would

be pleased to help you by answering your questions.

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2 Installation

This chapter describes how to install the ***sat-nms*** DEICE-Controller. You find a guide how to connect, configure and mechanically mount the DEICE-Controller below.

Before you start, please first read the Safety Instructions chapter below. It contains some important recommendations to prevent damage from the DEICE-Controller.

Then, we strongly recommend to do a first setup of the DEICE-Controller on a lab desk before installing it at its final location. This is mainly for one reason:

1. To setup the processor's IP parameters, the PC used for configuring and the DEICE-Controller must either be connected to the same Ethernet hub or must be connected directly with a crossover cable. The initialization program does not work through routers intelligent network switches.

Hence, the typical sequence of tasks when putting a ***sat-nms*** DEICE-Controller into operation is as follows:

1. Read the chapter Safety Instructions
2. Set the device's IP address
3. Mechanically mount the device.
4. Connect the DEICE-Controller at its destination environment.

2.1 Safety Instructions

Failure to observe all Warnings and Cautions may result in personnel injury and/or equipment damage not covered by the warranty.

- Follow standard Electrostatic Discharge (ESD) procedures when handling a ***sat-nms*** DEICE-Controller.
- Select and apply the appropriate 24V D/C voltage according to the data sheet and documentation **before** connecting power.
- Before you connect the DEICE-Controller to another unit, please make sure that the unit to which you connect can handle the voltage provided by the ***sat-nms*** DEICE-Controller.
- The ***sat-nms*** DEICE-Controller can be damaged if the input voltage is higher than the specified maximum value.
- Do not connect units that can be damaged by the output voltage of the ***sat-nms*** DEICE-Controller.
- In case of a failure do not open the device, you will lose warranty, call SatService GmbH for an RMA number.
- Observe normal safety precautions when operating, servicing, and troubleshooting this equipment.
- Take standard safety precautions with hand and/or power tools.

2.2 Setting the IP Address

Before you can operate the DEICE-Controller, you need to set the processor's IP address. There is a special configuration program on the documentation CD shipping with the DEICE-Controller for this purpose. We recommend to configure the processor's TCP/IP settings before you install the DEICE-Controller at its final place. To configure the DEICE-Controller, the following equipment is required:

- The ***sat-nms*** DEICE-Controller itself
- 2 24V D/C power supplies (If you want to build a redundancy Power supply, you need 4 24V D/C power supplies)
- A Computer running a Microsoft Windows operating system equipped with CD-ROM drive and

Ethernet network card.

- A CAT5 crossover network cable or an Ethernet hub and standard network cables to connect the DEICE-Controller and the computer.
- The CD-ROM shipping with the ***sat-nms*** DEICE-Controller.

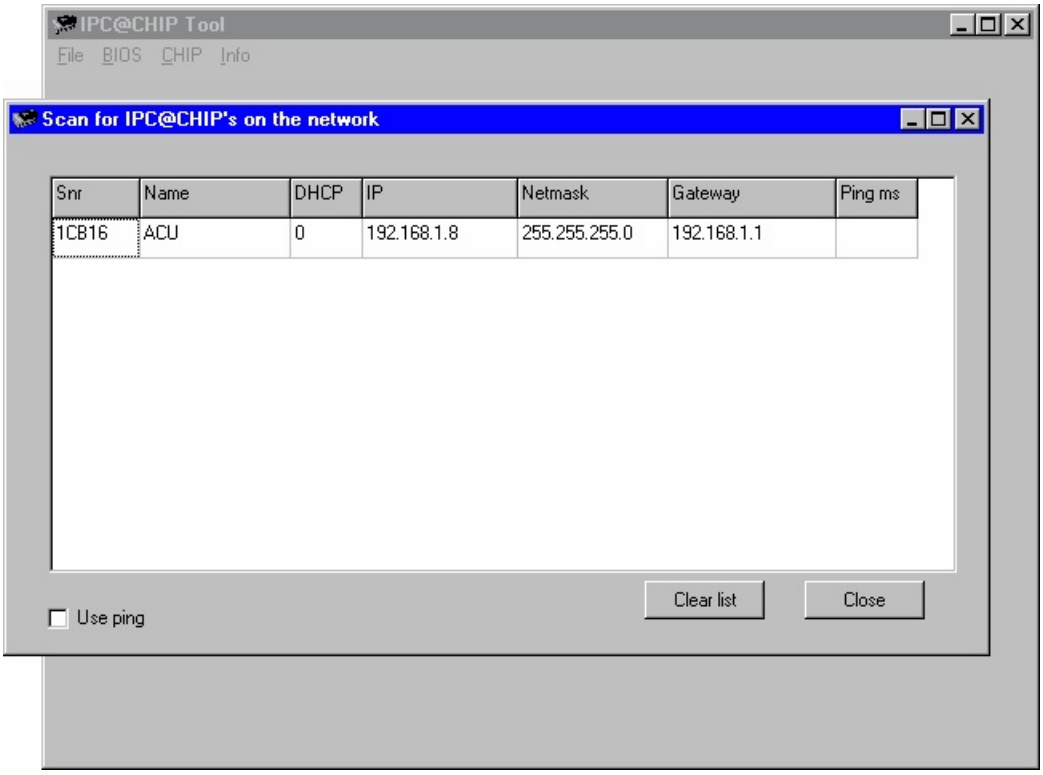
Setting the DEICE-Controllers IP parameters now is easily done within a few minutes.

1. First install a network cable between the DEICE-Controller and your computer. If you have a crossover cable available, this is very easy: simply put the cable into the network connectors of computer and DEICE-Controller. Without a crossover cable, you need to connect both, the computer and the DEICE-Controller to the same network hub using two standard network cables. It is essential, that the computer and the DEICE-Controller are connected to the same network segment, the configuration program is not able to find the DEICE-Controller through routers or network switches.

2. Now power on your computer and connect the DEICE-Controller to the 24V D/C supply.

3. Insert the CD-ROM into the computer's drive and inspect its contents through the 'My Computer' icon on your desktop. Double-click to the 'ChipTool.exe' program in the 'ChipTool' directory.

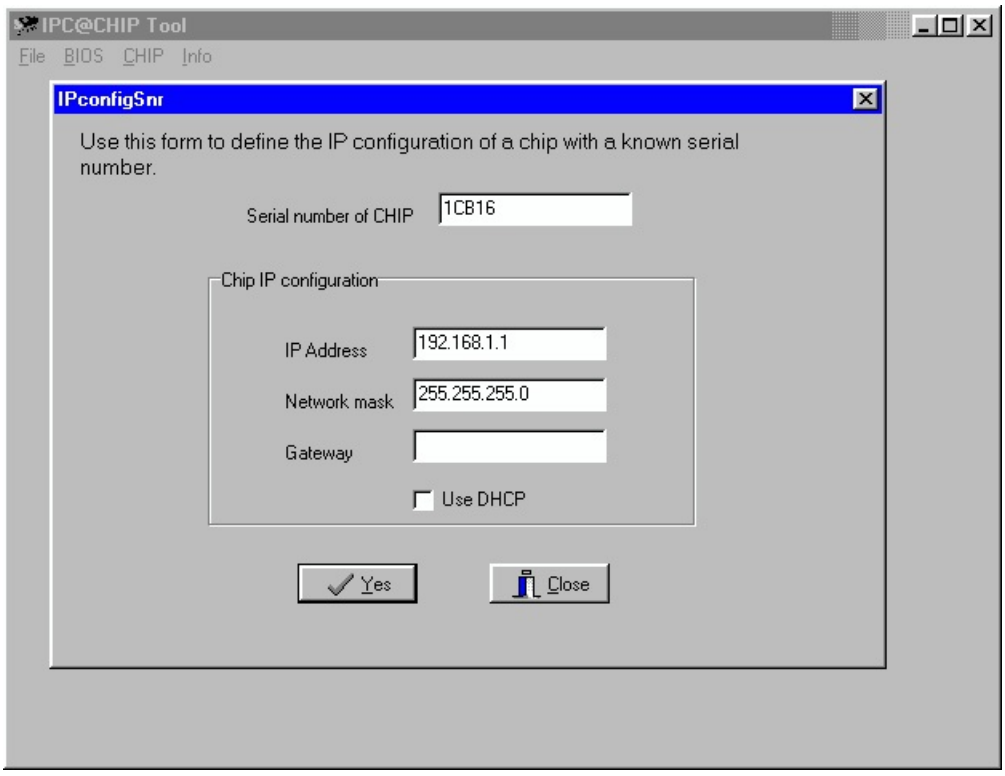
4. When the ChipTool program is running, type CTRL+F to make the program search the DEICE-Controller. The program shows a list containing at least one entry describing the actual network parameters of the DEICE-Controller.



5. The serial number shown in the first column of the list, must match the serial number printed on the processor's enclosure. If the list stays empty, the DEICE-Controller is not connected properly. If there are more entries in the list, the configuration program has found other devices in this network segment which use the same technology.

6. Now type CTRL+I to open the IP configuration window of the program. In this form enter the processor's serial number, its new IP address and network mask. If the DEICE-Controller later shall be

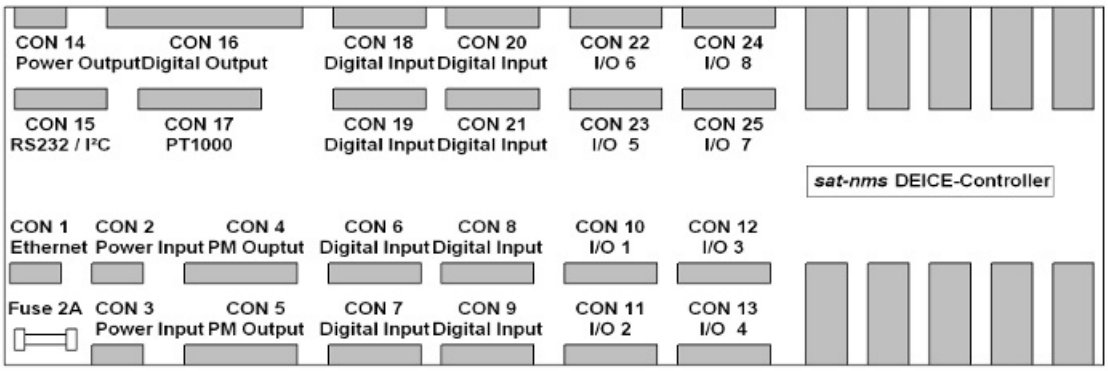
operated through a router, enter the address of the router on the gateway field, otherwise leave this field blank. Be sure, that the 'DHCP' mark is unchecked. Finally click to the 'Yes' button to set the new parameters at the DEICE-Controller



Now the IP configuration of the processor is completed. You may finally want to test if the DEICE-Controller is reachable now. Start your web browser and type the processor's IP address into the URL field of the browser. The DEICE-Controller should reply with its main page, provided that the processor and your computer are configured for the same subnet.

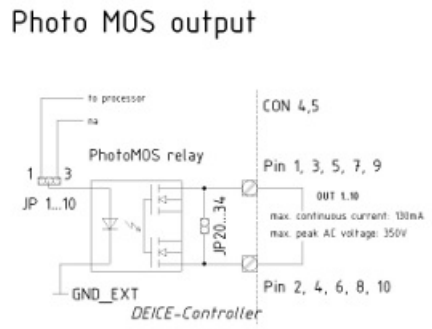
2.3 Connecting the DEICE-Controller

The diagram below shows the layout of the DEICE-Controller's connectors:

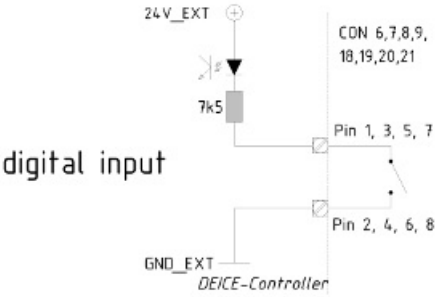


- **CON1** is the Ethernet 100Base-T / RJ45 connector. Use a standard network cable to connect the DEICE-Controller to an Ethernet hub. If you want to connect your computer and the DEICE-Controller directly without using a hub, you need a crossover cable for this with swapped RX/TX lines.

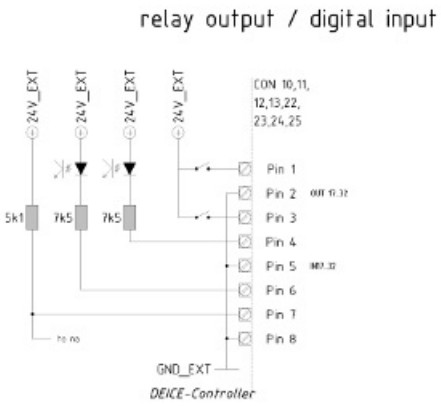
- **CON2** is to supply the ***sat-nms*** DEICE-Controller with power. You need two power packs, one for the +24VDC and another for the 24V_EXT circuit.
- **CON3** is to realize a redundant power supply system. When you connect two other power packs on this connector the ***sat-nms*** DEICE-Controller switches automatically to the other supply in case of current loss.
- **CON4 and CON5** are the digital outputs via photomos-relays. The standard configuration is that the outputs are normal digital outputs. Therefore you the Position of JP1...12 are 1-2. How to change this is described in chapter 2.4 configuring the ***sat-nms*** DEICE-Controller



- **CON6, CON7, CON8 and CON9** are the connectors for digital inputs 1...16. They are only able to detect potential-free contacts. Never put Voltage to this pins, the ***sat-nms*** DEICE-Controller might be damaged in this case.



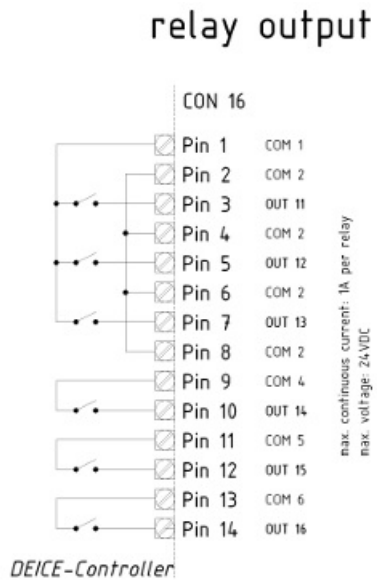
- **CON10, CON11, CON12 and CON13**are the connectors for digital inputs 33...40 and relay output 17...24 as 24V power output. The Inputs are only able to detect potential-free contacts. Never put Voltage to this pins, the ***sat-nms*** DEICE-Controller might be damaged in this case. The outputs deliver 24V in ON State and are open in OFF state. The pin allocation is the same on all these connectors.



- **CON14** is the spare power output. If you want to use the 24V_EXT for other units, you can take the

power from here. The maximum continuous current that can be taken from here is 500mA. Never exceed this limit; the DEICE-Controller might be damaged.

- **CON15** is the RS232 and the I2C-bus interface. If you need an adapter cable to connect the ***sat-nms*** DEICE-Controller via RS232 interface to your computer, call the support center of SatService GmbH. The I²C-bus interface can only be used with a customized software for the ***sat-nms*** DEICE-Controller and is for special requirements.
- **CON16** is the connector for the digital outputs switched by relays. COM1 is switched by three relays to OUT1...3. OUT4, OUT5 and OUT6 are the switched signals of IN4, IN5 and IN6. The external voltage that has to be switched by the relays may not exceed 24V. The maximum continuous current that can be switched is 1A.



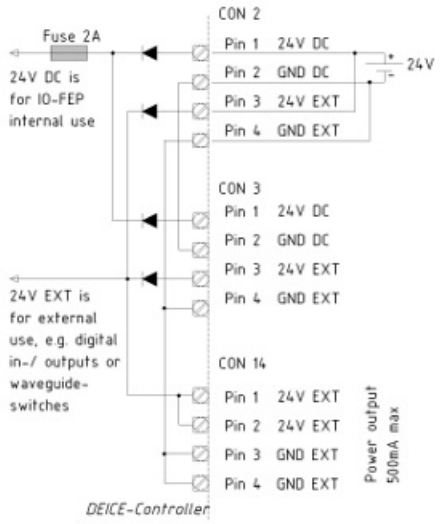
- **CON17** the external sensors to measure up to 4 temperatures have to be connected here. You can use any standard PT1000 type.
- **CON18, CON19, CON20 and CON21** are the connectors for digital inputs 17...32. They are only able to detect potential-free contacts. Never put Voltage to this pins, the ***sat-nms*** DEICE-Controller might be damaged in this case.
- **CON22, CON23, CON24 and CON25** are the connectors for digital inputs 41...48 and relay output 25...32 as 24V power output. The Inputs are only able to detect potential-free contacts. Never put Voltage to this pins, the ***sat-nms*** DEICE-Controller might be damaged in this case. The outputs deliver 24V in ON State and are open in OFF state. The pin allocation is the same on all these connectors.

Power supply

The ***sat-nms*** DEICE-Controller is prepared to use two different 24VDC power supplies: 24VDC is for the controller and processor circuit. 24V_EXT is used to supply the digital inputs and outputs. The DEICE-Controller is prepared for redundant power supply. So it is possible to supply the DEICE-Controller with one, two or four power supplies. We strongly recommend using minimum 2 power supplies to ensure the maximal system stability of the DEICE-Controller. The following pictures show you how to connect the power supplies to the DEICE-Controller.

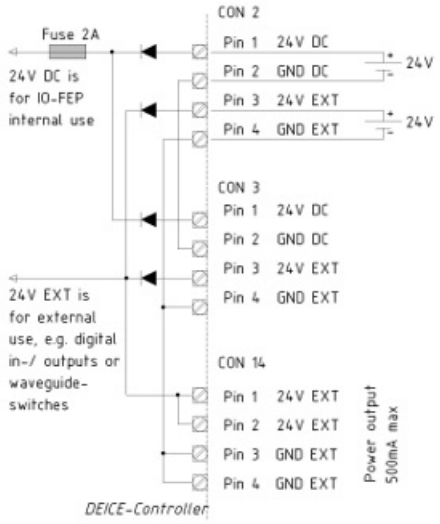
- **Using only one power supply**
  in this case 24VDC and 24V_EXT have to be connected to one power supply as you can see in the following picture

non-redundant power supply
with 1 power pack

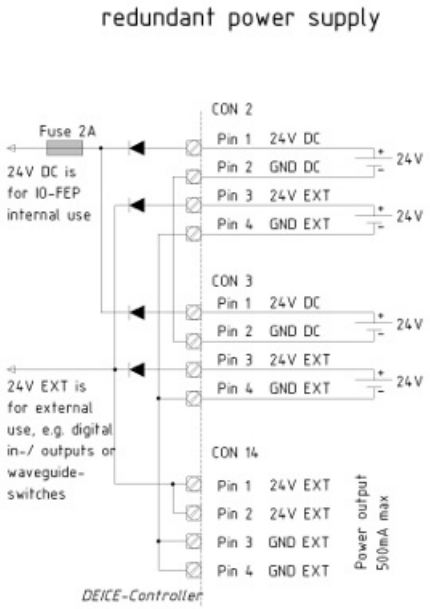


- **Using two power supplies**
  here one power supply is connected to the 24VDC input and the other one to the 24V_EXT input.

non-redundant power supply
with 2 power packs



- **Using four power supplies**
  if you like to have a redundant power supply for the DEICE-Controller you have to use 4 different power supplies. Connect them to the DEICE-Controller as you can see in the following picture. In case of failure of one power supply the DEICE-Controller is switching automatically to the other one and will be still running



The power supply for the +24VDC circuit has to have a minimum current load of 150mA. The supply for the 24V_EXT has to have a minimum current load of 500mA plus the current that will be taken from CON14 and the peak current of the biggest digital output to be controlled. Do not exceed the current-limit, in the circuit of 24V_EXT is no fuse implemented! The maximum peak-current for switching the digital outputs is 5A.

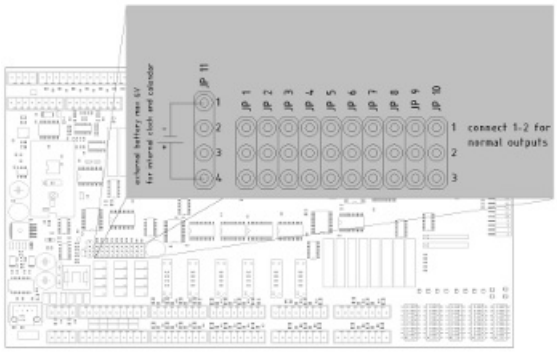
The fuse for +24VDC circuit is directly beneath the RJ45 connector CON1. In case of damage only put in their 2A types. Otherwise the ***sat-nms*** DEICE-Controller might be damaged.

2.4 Configuring the *sat-nms* DEICE-Controller

This chapter gives a short overview about some configuration parameters you want to set after you have installed the ***sat-nms*** DEICE-Controller. A complete reference of all available setup parameters is given in chapter 3.4 Installation Parameters.

Photomos-relay digital outputs

In the standard configuration of the ***sat-nms*** DEICE-Controller this outputs will be controlled as standard outputs therefore the configuration jumpers are in the upper position (pin 1-2). In the picture below you can see where to find these Jumpers on the PCB of the ***sat-nms*** DEICE-Controller. Dont't exceed the continuous current limit of 130mA and the continuous voltage of 48V DC. Otherwise the ***sat-nms*** DEICE-Controller might be damaged. If you want to switch inductive loads, don`t forget to add a clamp diode to limit the spike voltages in the switching moment.



2.5 Mechanical installation

The ***sat-nms*** DEICE-Controller enclosure is DIN rail mountable. Hence simply snap the ***sat-nms*** DEICE-Controller on to the rail to fix it. For plain wall mount, fix a minimum 100 mm piece of DIN rail at the wall with at least two screws and lock the ***sat-nms*** DEICE-Controller on this. For 19inch rack-mount, SatService GmbH offers a mounting plate. Call our distribution centre for more information.

When planning the mechanical installation of the ***sat-nms*** DEICE-Controller, please consider that cables to the ***sat-nms*** DEICE-Controller have to be fixed on the upper- and underside. So you need some space and something to fix the cables.

3 Operation

The ***sat-nms*** DEICE-Controller is designed to be controlled over a network link using a standard web browser. This means in practice, that the user interface to the DEICE-Controller appears in your browser window after you type in the DEICE-Controller's IP address in the address field of the browser program.

Operating the DEICE-Controller is mostly self-explanatory.

3.1 The Web-based User Interface

After having connected the DEICE-Controller to a power supply and set the DEICE-Controllers IP address, you can access the DEICE-Controller's user interface. To do this, start your favorite web browser program (Internet Explorer, Netscape Navigator, Opera or what else Program you prefer). At the address field, where you normally enter the URL of a web page you want to see, type in the IP address of the ***sat-nms*** DEICE-Controller you want to control.

The DEICE-Controller shows a web page consisting of a navigation bar at the left side of the browser window and the actual state display of the DEICE-Controller in the main part of the window. The readings automatically refresh once a second.

The navigation bar at the left contains a couple buttons which build the DEICE-Controller's main menu:

State	This button switches back to the DEICE-Controllers main page you already see when you connect to the DEICE-Controller. This page displays the actual state of the DEICE-Controller.
Settings	By clicking to this button you switch to the 'Settings' page where you can change the operation parameter of the DEICE-Controller and adjusting the loop parameter for the deice function.
Setup	Clicking this button expands the navigation bar, making the submenu buttons visible which give access to the several sections of the installation / setup dialog. A second click to the 'Setup' button folds the navigation bar to its original state.
Event Log	This button shows the DEICE-Controller's event log in the main display area (the most recent 25 entries). The DEICE-Controller records all input port changes and all switch actuations with a time stamp.
Info	After a mouse click to this button, the DEICE-Controller shows a table with information like the serial number of the device or the revision ID and compilation date of the software.
Help	Clicking to this button shows the on-line version of this user manual

3.2 Displayed State

The 'State' page is the main page of the DEICE-Controller which shows the actual state of all inputs and outputs. The page automatically refreshes every second (the refresh interval is configurable at the Setup / General page).

The page shows 6 tables containing all information about the input / output states, temperature readings and faults. The page is read-only; to change the settings go to the Settings page.

Deice Operation

The operation table shows the current state of the operation parameters:

- Mode: The mode state shows the operation state of the deicing controller. The following modes are possible. OFF - The deice function is off; all other operation states will be reseted to the start parameters. MANUAL - The deice will started manually by overwriting the deice sensor state. The heater/blowers will be only started if the ambient sensor state ON, the ambient temperature below the threshold (loop parameter setting page), the internal reflector temperature below the threshold minus the hysteresis and no Alarm of the Heater/Blower. AUTO - The system operates in auto mode which is the normal operation mode. Snow on the deice sensor will trigger the deice procedure.
- Request Deice: This state shows that a deice cycle is requested and the loop control of the heater/blowers is active.
- Active Stages: This state shows which stage of the heater/blowers is active. 0 = no stage is active. 1 = all Heater/Blowers which selected as HBL_SEL1 are active. 2 = Stage 1 and 2 are active. 3 = all stages active.
- Temperature slop: This value shows during the heating phase the temperature slope in the main reflector in °C per min. This value compared with the corresponding threshold is used to select the number of used stages.
- Summary Alarm: This state shows the summary Alarm of the deice section.

Deice Sensor State

The Sensor State shows the actual state of each sensor which is involved in the deice procedure:

- Deice Sensor / Remaining Time: The State ON means the sensor is triggered by snow. The remaining time counter will be started after the Sensor goes back to OFF and will display the time how long the deice cycle will be kept on after loss of the input trigger.
- Optic Sensor / Panel Temp.: This state is in the actual software version for information only and will displayed if snow inside the reflector and the temperature of the panel of the main reflector.
- Ambient Temp. Sensor: This state is ON if the temperature is below about 10°C and the real measured value. Attention: Only if the state is ON and the value is below the adjusted threshold deicing is possible.
- Reflector Temp. bottom / top: This value is used to control the temperature inside the reflector to the adjusted threshold.
- Sub-Reflector Control Temp.: This state controls the ON/OFF State of the Subreflector Heating.

Deice Heater/Blower State

The Heater/Blower State shows the actual state of each Heater/Blower:

- The first column is the index, which wills help to find the device in the setup section.
- The second column shows the name of the specific Heater/Blower unit to indentify the device.
- The third column displayed the state ON/OFF is the *logical* state of the output. By default ON stands for a closed contact, however, each individual output may be configured to the inverse function at the Setup / Output Circuits page.
- The fourth column gives information in which stages the Heater/Blower operates. Outputs configured as 'UNUSED' show neither a circuit name nor an ON/OFF state.
- The fifeth and sixth column shows the Alarm State of each Heater/Blower Unit. Two seperate Alarm Inputs are foreseen for each Heater/Blower Unit. Inputs configured as 'UNUSED' show neither an OK/FLT state.

Rain Blower Operation

The operation table shows the current state of the operation parameters:

- Mode: The mode state shows the operation state of the rain blower controller. The following modes are possible. OFF - The rain blower function is off, all other operation states will be reseted to the start

parameters. MANUAL - The rain blower will started manually by overwriting the rain sensor state. The heater/blower will be only started if no Alarm of the Heater/Blower. AUTO - The system operates in auto mode which is the normal operation mode. Rain or Snow on the deice sensor will trigger the rain blower procedure.

- Request Rainblower: This state shows that a rain blower cycle is requested and the control of the heater/blower is active.
- Summary Alarm: This state shows the summary Alarm of the rain blower section.

Rain Blower Sensor State

The Sensor State shows the actual state of each sensor which is involved in the rain blower procedure:

- Deice or Rain Sensor / Remaining Time: The State ON means the sensor is triggered by snow or rain. The remaining time counter will be started after the Sensor goes back to OFF and will display the time how long the rain blower cycle will be kept on after loss of the input trigger.

Rain Blower Heater/Blower State

The Heater/Blower State shows the actual state of each Heater/Blower:

- The first column is the index, which wills help to find the device in the setup section.
- The second column shows the name of the specific Heater/Blower unit to indentify the device.
- The third column displayed the state ON/OFF is the *logical* state of the output. By default ON stands for a closed contact, however, each individual output may be configured to the inverse function at the Setup / Output Circuits page.
- The fourth column gives information in which stages the Heater/Blower operates. Outputs configured as 'UNUSED' show neither a circuit name nor an ON/OFF state.
- The fifeth and sixth column shows the Alarm State of each Heater/Blower Unit. Two seperate Alarm Inputs are foreseen for each Heater/Blower Unit. Inputs configured as 'UNUSED' show neither an OK/FLT state.

3.3 Operation Parameter Setting

The page 'Settings' provides a 2-column table which is used to operate the DEICE-Controller. The settings are in particular:

Operation Parameter

Operation Mode Deice	The operation mode of the deicing controller is set here. The following modes are possible: OFF — The deice function is off; all other operation states will be reseted to the start parameters. MANUAL — The deice will started manually by overwriting the deice sensor state. AUTO — The system operates in auto mode which is the normal operation mode. Snow on the deice sensor will trigger the deice procedure. A single trigger of the deice procedure can be done by set the mode to MANUAL and back to AUTO. One cycle will be started with 59 minutes delay timer.
Operation Mode Rainblower	The operation mode of the rain blower controller is set here. The following modes are possible: OFF — The rain blower function is off, all other operation states will be reseted to the start parameters. MANUAL — The deice will started manually by overwriting the rain and deice sensor state.

	AUTO	The system operates in auto mode which is the normal operation mode. Snow or rain on the deice sensor will trigger the rain blower procedure. A single trigger of the rain blower procedure can be done by set the mode to MANUAL and back to AUTO. One cycle will be started with 59 minutes delay timer.

Loop Parameter

Internal Temperature Threshold	Sets maximal reflector internal temperature for the control loop. Should be around 15 to 30°C.
Ambient Temperature Threshold	Sets Ambient Temperature Threshold, below this temperature a deice cycle is possible, over this temperature the heater/blowers are switched off, because deicing is not needed.
Temperature Slope Threshold	Sets the requested speed of reaching the internal temperature threshold. If the slope below this setting the next stages will be activated.
Measurement Interval	Sets the measurement interval in which the measurement slope will be checked against the above threshold. After the first switch on, the measurement interval will be 3 times this interval.
Temperature Hysteresis	This value defines the hysteresis of the internal temperature threshold before the first stage can be activated.
Delay Deice Sensor	Delay timer for the Deice Sensor after loss of the input signal.
Delay Rain Sensor	Delay timer for the Rain Sensor after loss of the input signal.

3.4 Installation Parameters

The pages accessible through the 'Setup' menu items contain the DEICE-Controller's installation parameters. Installation parameters are protected by an administrator password, without a successful login ad administrator you may view the configuration settings but you may not change them.

Due to the large number of configuration settings, they are divided into several pages:

General Setup	Contains general configuration parameters like communication interface settings, passwords etc.
Output Circuits	The usage of the output circuits of the DEICE-Controller gets configured on this page
Input Circuits	The usage of the input circuits is configured at this page
Temperature Sensors	The temperature sensors connected to the DEICE-Controller are configured in this page.
State All	State of all Inputs and Outputs in the basic format
Set Outputs	Setting of all Outputs, which are set as normal outputs.

3.4.1 General Setup

The general setup page provides some general installation settings (section 'General') and the settings of the DEICE-Controller's SNMP agent (section 'SNMP Configuration'). The settings are in particular:

General

Display Title	By default the state page of the web interface is titled 'State'. You may change this title, e.g. to a station name or location. The display title also is replied to SNMP requests for the MIB-II 'sysName' parameter.
Date & Time	Click to 'Set Time' in order to set the actual date / time at the DEICE-Controller's real time clock. Enter the actual date / time in *exactly* the format *YYYY-MM-DD HH:MM:SS*.
State Page Refresh Rate	The state page by default refreshes automatically every second. The refresh rate may be slowed down, setting it to zero disables the automatic refresh completely.
Serial I/O Address	The serial interface may be operated either with the MOD-95 / Miteq protocol, using a device address 'A' to 'G' or with a simple ASCII / terminal protocol (setting 'NONE'). See chapter 4.3 The RS232 remote control interface for details.
User Password	Defines the user password (default 'user'), which is required to actuate switches or to set output circuits of the DEICE-Controller. An empty password disables the password prompting.
Administrator Password	Defines the administrator password (default 'admin'), which is required to change any configuration settings. An empty password disables the password prompting.

SNMP Configuration

Read Community	Sets the SNMP community string expected for read access. The default is 'public'.
Write Community	Sets the SNMP community string expected for write access. The default is 'private'.
Trap Community	Sets the SNMP community string sent with traps. The default is 'trap'.
Trap Destination IP 1	Enter the trap destination IP address (dotted quad notation) to make the DEICE-Controller sending traps by UDP to this host. Setting the parameter to 0.0.0.0 disables the trap generation.
Trap Destination IP 2	Enter the trap destination IP address (dotted quad notation) to make the DEICE-Controller sending traps by UDP to this host. Setting the parameter to 0.0.0.0 disables the trap generation.
Trap Destination IP 3	Enter the trap destination IP address (dotted quad notation) to make the DEICE-Controller sending traps by UDP to this host. Setting the parameter to 0.0.0.0 disables the trap generation.
Trap Destination IP 4	Enter the trap destination IP address (dotted quad notation) to make the DEICE-Controller sending traps by UDP to this host. Setting the parameter to 0.0.0.0 disables the trap generation.
System Location	The DEICE-Controller replies to MIB-II sysLocation requests with the text entered at this place.
System Contact	The DEICE-Controller replies to MIB-II sysContact requests with the text entered at this place.

Real Time Clock battery backup

The DEICE-Controller's real time clock is backed up by a goldcap capacitor. The goldcap supplies the RTC chip with power for several days if the main power is missing. This is the preferred mode of RTC backup for stationary installations of the DEICE-Controller.

For applications where the DEICE-Controller is powered up only occasionally, a lithium cell may be connected inside the DEICE-Controller housing in order to provide a permanent buffering of the clock.

3.4.2 Output Circuits

This page configures the usage of the output circuits provided by the DEICE-Controller. Outputs 1...10 refer to the photo-MOS outputs. Outputs 11...16 are the general purpose relay outputs of the DEICE-Controller. Outputs 17...32 are the 24VDC power relay outputs of the DEICE-Controller.

Following properties may be configured for each output:

Type	Defines the main purpose / type of the output: UNUSED — The output is not connected / not used OUTPUT — The output is configured as general purpose output, its state may be controlled at the web interface or through one of the M&C interfaces. INTERNAL — The output is controlled by the software. It is not accessible for general purpose. (e.g. The Alarm Outputs of the DEICE-Controller) BL-OFF — The output is selected as Heater/Blower Output of the DEICE-Controller, but is not selected for the stages. BL-SEL1 — The output is selected as Heater/Blower Output of the DEICE-Controller and is selected for operation as stages 1. BL-SEL2 — The output is selected as Heater/Blower Output of the DEICE-Controller and is selected for operation as stages 2. BL-SEL3 — The output is selected as Heater/Blower Output of the DEICE-Controller and is selected for operation as stages 3. SUB-OFF — The output is selected as Subreflector Heater Output of the DEICE-Controller, but is not selected. SUB-SEL — The output is selected as Subreflector Heater Output of the DEICE-Controller and is selected for operation. RBL-OFF — The output is selected as Rain Blower Output of the DEICE-Controller, but is not selected. RBL-SEL — The output is selected as Rain Blower Output of the DEICE-Controller and is selected for operation.
Name	When you activate an output at the 'Type' setting, the DEICE-Controller names this output as 'Oxx'. You may name the output in a more meaningful way by entering a circuit name at this place.
Polarity	'NORMAL' polarity closes the contact for the output setting 'ON'; 'INVERTED' polarity reverses this behavior. The polarity setting is not available if a photo-MOS output is configured as 'na'.

Please note, that the function of the outputs 1...10 first and foremost is controlled by the jumper settings (JP1...JP10) inside the DEICE-Controller.

3.4.3 Input Circuits

This page configures the usage of the input circuit's provided by the DEICE-Controller. The DEICE-Controller monitors 48 general purpose inputs. Each input may be configured as a simple state monitor, signaling its state as ON/OFF, or as alarm input signaling it' state as OK/FLT.

The following properties may be set for each individual input:

Type	Defines the main purpose / type of the input: UNUSED The input is not connected / not used. INPUT The input is used for general purpose state monitoring. It reports its state as ON/ OFF. ALARM The input is used for alarm monitoring. It reports its state as OK / FLT. LALARM The input is used for latched alarm monitoring. It reports its state as OK / FLT.
Name	When you activate an input at the 'Type' setting, the DEICE-Controller names this input as 'Ixx'. You may name the input in a more meaningful way by entering a circuit name at this place.
Polarity	'NORMAL' polarity signals 'ON' or 'FLT' for a closed contact, 'INVERTED' polarity reverses this behavior.
Delay	If this parameter is set to a non-zero value, the DEICE-Controller requires the input signal to be stable for at least the given time before a new state is signalled. You may use the delay to prevent short fault 'spikes' from being signaled.

3.4.4 Temperature Sensors

This page configures the temperature sensors. The DEICE-Controller contains an internal temperature sensor measuring the temperature on the circuit board. Additionally the DEICE-Controller offers inputs for up to four external (Pt-1000) temperature sensors which are used to monitor the temperature of the reflector bottom, top ambient and reflector panel. The DEICE-Controller's temperature measurement-circuit is calibrated before delivery, that's the reason why the offset sometimes is not set to 0,0°C in delivery state.

The following properties may be configured for each temperature sensor.

Enable	Setting this parameter to 'ENABLED' activates the monitoring for this sensor.
Name	You may enter a descriptive name for the temperature value measured with this sensor. The name appears at the main ('State') page.
Offset	Pt-1000 temperature sensors are very precise and do not require an individual calibration for simple monitoring applications. Nevertheless, a temperature offset may be defined for each sensor, e.g. to compensate for the cable resistance to the sensor. The displayed value is the sensor reading + the offset defined in this column.
Low/High Limit	You may define temperature limits for each sensor. The DEICE-Controller signals a fault if a temperature is outside the given limits. To disable the limit checking, set the limits to values like -100 / +300.

The internal temperature sensor of the DEICE-Controller cannot be disabled, its name is fixed to 'Board' and its offset is fixed to '0.0'.

3.4.5 State All

Output Circuits

The table columns 1...2 shows the current state of all outputs which are configured to work as operator controlled outputs. The following applies to all output states:

- The displayed state ON/OFF is the *logical* state of the output. By default ON stands for a closed contact, however, each individual output may be configured to the inverse function at the Setup / Output Circuits page.
- Outputs configured as 'UNUSED' show neither a circuit name nor an ON/OFF state.
- Outputs configured to act as DEICE-Controller circuits are displayed with a dimmed name, without a circuit state.

Input Circuits

The table columns 3...5 show the state of the input circuits provided by the DEICE-Controller.

- Inputs configured as 'INPUT' show the states ON or OFF.
- Inputs configured as 'ALARM' show the states OK or FLT.
- Rows referring to 'UNUSED' inputs are left empty.
- The displayed state is the *logical* state of each input. By default ON/FLT stands for a closed contact, however, each individual input may be configured to the inverse function at the Setup / Input Circuits page.
- The displayed state also takes into account the delay time configured for each individual input. (This probably will not be visible for short delay times)

Temperature Readings

The DEICE-Controller displays the internal temperature and the reading of up to four external temperature sensors at the table field below the output circuits. For each sensor the sensor name, the temperature and an OK/FLT state is shown. A temperature value is considered 'OK' if the value is inside the limits configured at the Temperature Sensors page.

3.4.6 Set Outputs

The page 'Set Outputs' provides a 2-column table which is used to operate output circuits of the DEICE-Controller which are configured as OUTPUT and not used as DEICE-Controller Outputs. The display isn't updated automatically, so the displayed state may be outdated if the page is left open.

Clicking to the state of an output opens a dialog which provides buttons to change the output state. This dialog is password protected; you are required to login in order to change the state of output circuits.

3.5 Event Log

The DEICE-Controller provides an internal event log which records all changes at input circuits, output circuit actuations and temperature limit alarms. Each event is stored with a time stamp read from the DEICE-Controller's real time clock. The event log is limited to a size of 500 events, the log works as a circular buffer and recent entries automatically overwrite the oldest ones. The event log resides in the DEICE-Controller's volatile memory; the log always starts empty when the DEICE-Controller is powered on.

The event log page shows up 25 entries from the event log in a table. Initially the 25 recent entries of the log are shown. Five buttons above the event log table control the display of the log:

CLEAR	Clears the latched alarms.
CLEAR	Clears the event log.
	Jumps to the oldest entries in the log
	Goes one page back to older entries
	Goes one page forward, to more recent entries
	Jumps to the most recent entries in the log.

The display of the event log does not automatically update if new events are added, use the browser's reload button or to see if new events have been added.

4 Remote Control

The ***sat-nms*** DEICE-Controller may be controlled remotely by a monitoring and control application either through the TCP/IP interface or through a serial RS232 interface. Both communication methods use the same commands and parameters, however, there are different frames around each message depending communication method used.

Controlling the device from the web interface, the TCP/IP remote control interface or via the serial interface is completely equal, commands may sent to any interface at any time, the DEICE-Controller will use the parameter it receives last.

4.1 General command syntax

The DEICE-Controller knows a number of parameters, each identified by a parameter name. To set a certain parameter to a new value, a message:

name=value

has to be sent to the DEICE-Controller. The DEICE-Controller interprets this command, checks the range of *value* and sets the internal parameter and then answers:

name=value

The *value* in the reply is the value actually recognized by the DEICE-Controller. For instance, if the requested value was out of range, the replied (and internally used) value is limited to the applicable minimum or maximum.

To read a parameter from the DEICE-Controller, instead of a new parameter value a question mark is sent:

name=?

The DEICE-Controller replies the actual value in a complete message:

name=value

A complete list of the parameter the DEICE-Controller knows is shown later in this document in chapter Parameter list. Below, some common rules applying to the remote control message syntax are summarized.

- Parameter names always are of lower case letters, most of them are four characters long.
- Non-numeric parameter values always are written in upper case.
- Numeric (floating point) values may be specified with an arbitrary precision; however the device will reply only a fixed number of places. The DEICE-Controller recognizes a decimal point ('.'), numbers must not contain any commas.
- There must not be any whitespace in front or after the '=' in a message.
- If the command/query is not of the form **name=value** or **name=?**, the DEICE-Controller replies the message **?SYNTAX**.
- If the message syntax is OK, but contains an unknown parameter name is used, the reply is **? UNKNOWN**
- Numeric parameters are cut to the limits defined for this particular parameter.
- Misspelled choice values cause the DEICE-Controller to set the first value of the choice list.
- Assigning a value to a read-only parameter will cause no fault, however the DEICE-Controller will overwrite this parameter immediately or some seconds later with the actual value.

4.2 The TCP/IP remote control interface

Controlling the DEICE-Controller through the network is done by means of HTTP GET requests. Setting parameter values or querying readings or settings, all is done by requesting HTTP documents from the DEICE-Controller. The message *to* the DEICE-Controller thereby is coded into the URL as a CGI form parameter. The DEICE-Controller replies a one line document of the MIME type 'text/plain'.

The document name for remote control is **/rmt**, hence (assuming the DEICE-Controller is listening to the IP address 10.0.0.1), requesting a document with the URL

http://10.0.0.1/rmt?tmp0=?

will let the DEICE-Controller reply the actual level in a one line text document:

tmp0=36.3

This way all parameters may be queried or set, you may use your favorite web browser to try out the remote control of the DEICE-Controller manually.

4.3 The RS232 remote control interface

Beside the network interface, the DEICE-Controller also provides an RS232 serial port which can be used to control the device remotely. Depending on the device address set, the DEICE-Controller either runs framed protocol with start/stop characters and checksum or it provides a dumb terminal interface. The RS232 interface always operates at 9600 baud, no parity, 8 data bits and one stop bit.

If an address 'A'...'G' is selected, the DEICE-Controller expects each message it receives to be packed into a frame as described below.

char #	*example*	*description*
1	{	start character, always '{'
2	A	device address (A...G)
3	t	first character of the message body
.	m	message body ...
.	p	..
.	0	..
.	=	..
n-1	?	last character of the message body
n	}	end character, always '}'
n+1	.	checksum

The checksum byte is calculated using an algorithm as implemented by the following formula:

$$sum = 32 + \left(\sum_{i=1}^{n} (byte[i] - 32) \right) \text{ modulo } 95$$

This protocol type is known as *MOD95*- or *Miteq protocol*. The DEICE-Controller also packs its reply in a protocol frame as described above. Incomplete frames, checksum errors or address mismatches let the

DEICE-Controller ignore the message. The time between the characters of a message must be less than 5 seconds or the DEICE-Controller will treat the message as incomplete.

If the DEICE-Controller is set to the device address 'NONE', it uses a simple line protocol instead of the framed protocol described above. Messages sent to the DEICE-Controller have to be terminated with a carriage return character (ASCII 13); the DEICE-Controller terminates replies with a CR/LF pair (ASCII 13/10). There is no echo for characters entered; hence this protocol easily may be used for computer based remote control.

4.5 SNMP Control

The DEICE-Controller contains an SNMP agent listening at UDP port 161. The SNMP agent provides a common subset of the MIB-II system / interface parameters and gives full access to the remote control capabilities of the DEICE-Controller with a number of MIB objects placed in the private.enterprises tree.

The actual MIB file defining the DEICE-Controller's private MIB may be downloaded from the DEICE-Controller itelf by FTP (user 'service', password 'service'). The file 'DEICE.MIB' contains all necessary information

4.4 Parameter list

The table below shows the complete list of M&C parameters the DEICE-Controller knows. For each parameter the valid range and a short description are given.

General

name		*description*
time	r/o	Delivers date / time, format YYY-MM-DD HH:MM:SS
stim		Sets date / time, format YYY-MM-DD HH:MM:SS
sver	r/o	Software version
srno	r/o	Device serial no
tmp0	r/o	Board temperature (deg C)

DEICE-Controller specific

name		*description*
modd		Operation Mode Deice (OFF,MANUAL,AUTO)
modr		Operation Mode Rainblower (OFF,MANUAL,AUTO)
itth		Intern Temp. Threshold (0..45°C)
atth		Ambient Temp. Threshold (0..10°C)
tsth		Temp. Slope Threshold (0..10°Cpermin)
mtim		Measurement Interval (0..600 secs)
htmp		Temp. Hysteresis (0..10°C)
dice		Delay Deice Sensor (0..59min.)
drai		Delay Rain Sensor (0..59min.)
rsta		Reset Latched Faults (1)

stmd	r/o	Status Deice Operation
stdl	r/o	Status Deice Delay
sttp	r/o	Status Deice Output Type
stot	r/o	Status Deice Output
stal	r/o	Status Deice Alarm
stsn	r/o	Status Deice Sensors
stn0..a	r/o	Status Deice Name HBL1..11 (30 character max)
stns	r/o	Status Deice Name Sub (30 character max)
stnr	r/o	Status Deice Name Rain (30 character max)

Status Deice Operation monitoring

The command 'stmd=?' returns a 6 character string which contains the operation state of the DEICE CONTROLLER, Example:

```
D1a0R1
 | | |
 | | Rainblower request to be ON
 | Number of the active stages (0 to 3)
 Deice request to be ON
```

Status Deice Delay monitoring

The command 'stdl=?' returns a 6 character string which contains the delay state of the DEICE CONTROLLER, Example:

```
D59R59
  |  |
  |  Delay time in minutes Rainblower
  Delay time in minutes Deice
```

Status Deice Output Type monitoring

The command 'sttp=?' returns a 15 character string which contains the type state in HEX of all deice outputs of the DEICE CONTROLLER, Example:

```
D444555666308RA
 |         || |
 |         || Output Type Rainblower Output
 |         |Output Type Deice Subreflector
 |         Output Type Deice Output HB-11
 Output Type Deice Output HB-1
```

Type	*Hex*	*description*
UNUSED	0	not used in this application
OUTPUT	1	used as normal Output, not used as Deice circuit
INTERNAL	2	used for internal settings, not used as Deice circuit
BL_OFF	3	Blower OFF
BL_SEL1	4	Blower Selected to Stage 1

BL_SEL2	5	Blower Selected to Stage 2
BL_SEL3	6	Blower Selected to Stage 3
SUB_OFF	7	Subreflector OFF
SUB_SEL	8	Subreflector Selected
RBL_OFF	9	RainBlower OFF
RBL_SEL	A	RainBlower Selected

Status Deice Output State monitoring

The command 'stot=?' returns a 15 character string which contains the state of all deice outputs of the DEICE CONTROLLER, Example:

```
D000000000000R1
 |         || |
 |         || Output State Rainblower Output
 |         |Output State Deice Subreflector
 |         Output State Deice Output HB-11
 Output State Deice Output HB-1
```

Status Deice Alarm State monitoring

The command 'stal=?' returns a 15 character string which contains the alarm state of all deice outputs of the DEICE CONTROLLER, Example:

```
D100000000020R0
 |         || |
 |         || Output Alarm State Rainblower Output
 |         |Output Alarm State Deice Subreflector
 |         Output Alarm State Deice Output HB-11
 Output Alarm State Deice Output HB-1
```

Type	*Hex*	*description*
NOALARM	0	everything is OK
ALARM 1	1	Alarm Input 1 of this Blower stage is active
ALARM 2	2	Alarm Input 2 of this Blower stage is active
ALARM	3	Alarm Input 1 and 2 of this Blower stage is active

Status Deice Sensor State monitoring

The command 'stsn=?' returns a 32 character string which contains the sensor state of the DEICE CONTROLLER, Example:

```
D0O1A1M0S0a09.5b14.5t30.5p09.5R0
 | | | | |    |    |    |    | |
 | | | | |    |    |    |    | Rain Sensor
 | | | | |    |    |    |    Reflector Panel Temp.
 | | | | |    |    |    Reflector Chamber Top Temp.
 | | | | |    |    Reflector Chamber Bottom Temp.
 | | | | |    Ambient Temp.
 | | | | Subreflector 47°C Control Temp. Sensor
```

```
| | | Main Reflector 40°C Alarm Temp. Sensor
| | Ambient 4°C Release Temp. Sensor
| Optical Snow Sensor
Deice/Snow Sensor
```

Additional

name		*description*
tmp1..4	r/o	Temperature sensor 1..4 (deg C)
outp		Digital outputs
stat	r/o	I/O state

I/O state monitoring

The command 'stat=?' returns a 32 character string which contains the complete I/O state of the DEICE-Controller, coded in 4 hexadecimal numbers. Example:

```
000000000010 00000400 00 00
          |       |   |  |
          |       |   |  no hi temperature faults
          |       |   no low temperature faults
          |       Output 11 is ON
          Input 5 is on
```

Inputs	The first number (12 characters, 48 bits) reports the state of the DEICE-Controller input circuits. Each bit of the hexadecimal number corresponds to one input. The least significant bit corresponds to input 1. A bit set to '1' reports an 'ON' or 'FLT' input, inputs which are 'OK' or 'OFF' read '0'. The reported port states are logical states; they already include the polarity inversion and filtering delay as defined in the setup for each individual port. Unused ports always read '0'.
Outputs	The second number (8 characters, 32 bits) reports the actual state of the output ports in a similar way. The contents of this are exactly the same as the reply to 'outp=?': pit 0 corresponds to the state of PhotoMOS output 1, bit 15 to the state of the relay 6. A bit set to 1 tells that the output is 'ON' as displayed at the user interface. A software polling the 'stat=?' variable frequently may parse the output state from here rather from 'outp=?', thus saving some protocol overhead.
Temperature Faults	The words 4 (low temperature faults) and 5 (high temperature faults) encode the limit faults for the temperature sensors of the DEICE-Controller. The least significant bit corresponds to the internal board temperature sensor, bit 1 to the external temperature sensor 1 and so on.

Output control

The command 'outp=?' returns an 8 digit, 32 bit hexadecimal number showing the actual state of all outputs of the DEICE-Controller. Bit 0 corresponds to the state of PhotoMOS output 1, bit 15 to the state of the relay 6. A bit set to 1 tells that the output is 'ON' as displayed at the user interface.

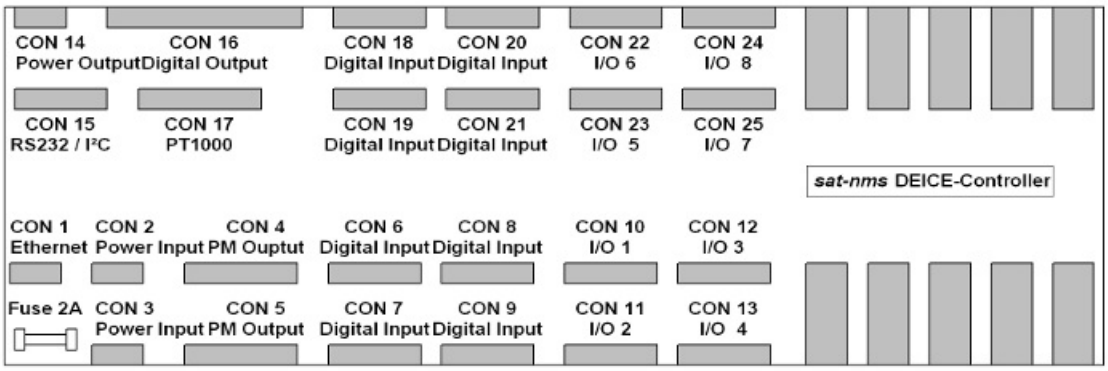
Writing a 'outp=xxxxxxxx' sets all outputs of the DEICE-Controller. To set or clear a single output, you have to read the actual state, set/clear the appropriate bit and send the number back to the DEICE-Controller.

Outputs which are not configured as type 'OUTPUT' always read '0'. Setting these outputs has no effect; the DEICE-Controller silently ignores commands to outputs which are not configured to act as a general

purpose output.

5 Connector Reference

Connector layout DEICE-Controller



CON1 LAN

Pin	*Identifier*	*Description*	*Type*	*Remark*
1	TX+	default Ethernet cabling (10Base-T)	OUT	
2	TX-		OUT	
3	RX+		IN	
4				
5				
6	RX-		IN	
7				
8				

CON2 power input

Pin	*Identifier*	*Description*	*Type*	*Remark*
1	24V DC	voltage input for DEICE-Controller	DC in	
2	GND DC		DC in	
3	24V EXT	voltage input for WG Switches etc.	DC in	
4	GND EXT		DC in	

CON3 power input

Pin	*Identifier*	*Description*	*Type*	*Remark*
1	24V DC	voltage input for DEICE-Controller	DC in	
2	GND DC		DC in	
3	24V EXT	voltage input for WG Switches etc.	DC in	
4	GND EXT		DC in	

CON4 output 1..5

Pin	*Identifier*	*Description*	*Type*	*Remark*
1	IN1	Output 1 in	DC in	
2	OUT1	Output 1 out	DC out	JP1: 1-2 d-out, 2-3 na
3	IN2	Output 2 in	DC in	
4	OUT2	Output 2 out	DC out	JP2: 1-2 d-out, 2-3 na
5	IN3	Output 3 in	DC in	
6	OUT3	Output 3 out	DC out	JP3: 1-2 d-out, 2-3 na
7	IN4	Output 4 in	DC in	
8	OUT4	Output 4 out	DC out	JP4: 1-2 d-out, 2-3 na
9	IN5	Output 5 in	DC in	
10	OUT5	Output 5 out	DC out	JP5: 1-2 d-out, 2-3 na

CON5 output 6..10

Pin	*Identifier*	*Description*	*Type*	*Remark*
1	IN6	Output 6 in	DC in	
2	OUT6	Output 6 out	DC out	JP6: 1-2 d-out, 2-3 na
3	IN7	Output 7 in	DC in	
4	OUT7	Output 7 out	DC out	JP7: 1-2 d-out, 2-3 na
5	IN8	Output 8 in	DC in	
6	OUT8	Output 8 out	DC out	JP8: 1-2 d-out, 2-3 na
7	IN9	Output 9 in	DC in	
8	OUT9	Output 9 out	DC out	JP9: 1-2 d-out, 2-3 na
9	IN10	Output 10 in	DC in	
10	OUT10	Output 10 out	DC out	JP10: 1-2 d-out, 2-3 na

CON6 digital input

Pin	*Identifier*	*Description*	*Type*	*Remark*
1	DIN 1	digital input	input	HBL1-AL1
2	GND	reference voltage	DC out	
3	DIN 2	digital input	input	HBL2-AL1
4	GND	reference voltage	DC out	
5	DIN 3	digital input	input	HBL3-AL1
6	GND	reference voltage	DC out	
7	DIN 4	digital input	input	HBL4-AL1
8	GND	reference voltage	DC out	

CON7 digital input

Pin	*Identifier*	*Description*	*Type*	*Remark*
1	DIN 5	digital input	input	HBL5-AL1
2	GND	reference voltage	DC out	
3	DIN 6	digital input	input	HBL6-AL1
4	GND	reference voltage	DC out	
5	DIN 7	digital input	input	HBL7-AL1
6	GND	reference voltage	DC out	
7	DIN 8	digital input	input	HBL8-AL1
8	GND	reference voltage	DC out	

CON8 digital input

Pin	*Identifier*	*Description*	*Type*	*Remark*
1	DIN 9	digital input	input	HBL9-AL1
2	GND	reference voltage	DC out	
3	DIN 10	digital input	input	HBL10-AL1
4	GND	reference voltage	DC out	
5	DIN 11	digital input	input	HBL11-AL1
6	GND	reference voltage	DC out	
7	DIN 12	digital input	input	SUB-AL1
8	GND	reference voltage	DC out	

CON9 digital input

Pin	*Identifier*	*Description*	*Type*	*Remark*
1	DIN 13	digital input	input	RBL-AL1
2	GND	reference voltage	DC out	
3	DIN 14	digital input	input	Int. Temp. Sens-AL
4	GND	reference voltage	DC out	
5	DIN 15	digital input	input	Amb. Temp. Sens
6	GND	reference voltage	DC out	
7	DIN 16	digital input	input	Sub. Temp. Sens.
8	GND	reference voltage	DC out	

CON10 I/O 1

Pin	*Identifier*	*Description*	*Type*	*Remark*
1	OUT 17	24VDC out	DC out	HBL1
2	GND_EXT	GND	DC out	

3	OUT 18	24VDC out	DC out	HBL2
4	IN 33	input	DC in	
5	GND_EXT	com	DC out	
6	IN 34	input	DC in	
7	na	na	na	
8	na	na	na	

CON11 I/O 2

Pin	*Identifier*	*Description*	*Type*	*Remark*
1	OUT 19	24VDC out	DC out	HBL3
2	GND_EXT	GND	DC out	
3	OUT 20	24VDC out	DC out	HBL4
4	IN 35	input	DC in	
5	GND_EXT	com	DC out	
6	IN 36	input	DC in	
7	na	na	na	
8	na	na	na	

CON12 I/O 3

Pin	*Identifier*	*Description*	*Type*	*Remark*
1	OUT 21	24VDC out	DC out	HBL5
2	GND_EXT	GND	DC out	
3	OUT 22	24VDC out	DC out	HBL6
4	IN 37	input	DC in	
5	GND_EXT	com	DC out	
6	IN 38	input	DC in	
7	na	na	na	
8	na	na	na	

CON13 I/O 4

Pin	*Identifier*	*Description*	*Type*	*Remark*
1	OUT 23	24VDC out	DC out	HBL7
2	GND_EXT	GND	DC out	
3	OUT 24	24VDC out	DC out	HBL8
4	IN 39	input	DC in	
5	GND_EXT	com	DC out	
6	IN 40	input	DC in	

7	na	na	na	
8	na	na	na	

CON14_Power_output

Pin	*Identifier*	*Description*	*Type*	*Remark*
1	24V EXT	spare outputs	DC out	
2	24V EXT		DC out	
3	GND EXT		DC out	
4	GND EXT		DC out	

CON15 RS232 I2C

Pin	*Identifier*	*Description*	*Type*	*Remark*
1	RS232 0 TX	RS232 access 0	output	
2	RS232 0 RX		input	
3	GND		DC out	
4	RS232 1 TX	RS232 access 1	output	
5	RS232 1 RX		input	
6	I2C SDA	I²C data	output	
7	I2C SCL	I²C clock	output	
8	GND		DC out	

CON16 digital out

Pin	*Identifier*	*Description*	*Type*	*Remark*
1	COM 11		input	
2	COM 12		input	
3	OUT 11	switched COM1 by RE6	output	Deice Mode
4	COM 12		input	
5	OUT 12	switched COM1 by RE5	output	Deice Requested
6	COM 12		input	
7	OUT 13	switched COM1 by RE4	output	Rain BL Mode
8	COM 12		input	
9	COM 14		input	
10	OUT 14	switched IN4 by RE3	output	Rain BL Requested
11	COM 15		input	
12	OUT 15	switched IN5 by RE2	output	Deice Alarm
13	COM 16		input	
14	OUT 16	switched IN6 by RE1	output	Rain BL Alarm

CON17 external temperature sensors

Pin	*Identifier*	*Description*	*Type*	*Remark*
1	SENS OUT1	output to PT1000	DC out	
2	SENS IN1	input to PT1000	DC in	Ambient Temp.
3	SENS OUT2	output to PT1000	DC out	
4	SENS IN2	input to PT1000	DC in	Panel Temp.
5	SENS OUT3	output to PT1000	DC out	
6	SENS IN3	input to PT1000	DC in	Int. Temp Refl. bottom
7	SENS OUT4	output to PT1000	DC out	
8	SENS IN4	input to PT1000	DC in	Int. Temp. Refl. top

CON18 digital input

Pin	*Identifier*	*Description*	*Type*	*Remark*
1	DIN 17	digital input	input	HBL1-AL2
2	GND	reference voltage	DC out	
3	DIN 18	digital input	input	HBL2-AL2
4	GND	reference voltage	DC out	
5	DIN 19	digital input	input	HBL3-AL2
6	GND	reference voltage	DC out	
7	DIN 20	digital input	input	HBL4-AL2
8	GND	reference voltage	DC out	

CON19 digital input

Pin	*Identifier*	*Description*	*Type*	*Remark*
1	DIN 21	digital input	input	HBL5-AL2
2	GND	reference voltage	DC out	
3	DIN 22	digital input	input	HBL6-AL2
4	GND	reference voltage	DC out	
5	DIN 23	digital input	input	HBL7-AL2
6	GND	reference voltage	DC out	
7	DIN 24	digital input	input	HBL8-AL2
8	GND	reference voltage	DC out	

CON20 digital input

Pin	*Identifier*	*Description*	*Type*	*Remark*
1	DIN 25	digital input	input	HBL9-AL2
2	GND	reference voltage	DC out	

3	DIN 26	digital input	input	HBL10-AL2
4	GND	reference voltage	DC out	
5	DIN 27	digital input	input	HBL11-AL2
6	GND	reference voltage	DC out	
7	DIN 28	digital input	input	SUB-AL2
8	GND	reference voltage	DC out	

CON21 digital input

Pin	*Identifier*	*Description*	*Type*	*Remark*
1	DIN 29	digital input	input	RBL-AL2
2	GND	reference voltage	DC out	
3	DIN 30	digital input	input	Rain Sens.
4	GND	reference voltage	DC out	
5	DIN 31	digital input	input	Deice Sens
6	GND	reference voltage	DC out	
7	DIN 32	digital input	input	Opt. Sens
8	GND	reference voltage	DC out	

CON22 I/O 6

Pin	*Identifier*	*Description*	*Type*	*Remark*
1	OUT 27	24VDC out	DC out	HBL11
2	GND_EXT	GND	DC out	
3	OUT 28	24VDC out	DC out	SUB
4	IN 43	input	DC in	
5	GND_EXT	com	DC out	
6	IN 44	input	DC in	
7	na	na	na	
8	na	na	na	

CON23 I/O 5

Pin	*Identifier*	*Description*	*Type*	*Remark*
1	OUT 25	24VDC out	DC out	HBL9
2	GND_EXT	GND	DC out	
3	OUT 26	24VDC out	DC out	HBL10
4	IN 41	input	DC in	
5	GND_EXT	com	DC out	
6	IN 42	input	DC in	

7	na	na	na	
8	na	na	na	

CON24 I/O 8

Pin	*Identifier*	*Description*	*Type*	*Remark*
1	OUT 31	24VDC out	DC out	
2	GND_EXT	GND	DC out	
3	OUT 32	24VDC out	DC out	
4	IN 47	input	DC in	
5	GND_EXT	com	DC out	
6	IN 48	input	DC in	
7	na	na	na	
8	na	na	na	

CON25 I/O 7

Pin	*Identifier*	*Description*	*Type*	*Remark*
1	OUT 29	24VDC out	DC out	RBL
2	GND_EXT	GND	DC out	
3	OUT 30	24VDC out	DC out	
4	IN 45	input	DC in	
5	GND_EXT	com	DC out	
6	IN 46	input	DC in	
7	na	na	na	
8	na	na	na	

6 Specifications

Specifications DEICE-Controller

General Interfaces	**qty**	**Connector No.**	**remark**
System Interfaces			All interfaces (except the Ethernet-interface) have to be connected via Mini Combicon MCV1,5/XX-G-3,5
external Temperature measurement	4	17	via external PT1000 sensors, accuracy +/- 3°C, range: -40 to +60°C
internal Temperature measurement	1	---	via internal on-chip-sensor, accuracy +/-3°C
internal clock/ calendar	1	---	real-time clock/ calendar. If power supply is missing, a goldcap capacitor keeps the clock running for min. 7 days
digital input	32	6, 7, 8, 9, 18, 19, 20, 21	via optocoupler, indication current: ~3mA @ 24V DC
digital output	6	16	relay contacts, max. continuous current: 1A, max continuous voltage: 24V DC
P-MOS digital output	10	4, 5	Photomos-relays, per relay max. continuous current: 130mA, max. continuous voltage: 48V, on-state-resistance ~25Ohm
HPA-muting matrix	10x8		software HPA-muting or DIP-switches for hardware-HPA-muting
digital power output	16	10, 11, 12, 13, 22, 23, 24, 25	maximum peak switching current: 5A
digital input	16		via optocoupler, indication current: ~3mA @ 24V DC
power output	1	14	24V DC, max 500mA
I²C	1	15	for special requirements, only usable with customized Software
RS232	1	15	for controlling the DEICE-Controller
Ethernet	1	1	RJ45, 10/100-Base-T, for controlling the DEICE-Controller via HTTP GET or any Web-browser
M&C Interface Specification			
interface for M&C and user			10/ 100-Base-T, Via HTTP GET requests, RS232, SNMP
Electrical and Mechanical			

Specification, Environmental conditions			
Supply Voltage			24 V unregulated D/C
Power consumption 24V DC		2, 3	max. 150mA
Power consumption 24V EXT		2, 3	max. 450mA (excluding power output at CON14 and the switching current of the waveguide switches)
Temperature range			5° to 50° C
Humidity			up to 90% non condensing
DIN rail module			264 x 165 x 60 mm
Weight			1,5 kg